Experimental and observational studies illuminate the origins, functions, and possible individual differences in early metaphoric language.

first metaphors

ellen winner
margaret mccarthy
sandra kleinman
howard gardner

How we ever come to say, think, or create something new is one of the most fundamental and, at the same time, one of the least resolved issues in cognitive psychology. It is this ability to create something new that distinguishes humans from other animals and makes advances in diverse forms of knowledge possible. But, perhaps reflecting the fundamental nature of this issue, the documentation of just how something new can arise from what is already given proves a very difficult puzzle. Indeed, some psychologists and philosophers claim that current theories of learning are logically incapable of accounting for the construction of new knowledge; they are plagued with the paradox that for a concept to be learned, it must be present at birth (see, for example, Fodor, 1975).

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While the resolution of this puzzle is still a distant goal, we feel that some insight into this issue can be gained. We propose here to examine the earliest forms of behavior which, by its very nature, epitomizes the processes involved in novel thought—the invention of linguistic metaphor. To create a metaphor is to recognize an aspect of similarity between elements conventionally viewed as dissimilar—to see something in a radically new way. Because such vision (or *re*-vision) involves a restructuring of conventional categories, metaphor is an outstanding example of novel thought. As we will argue below, metaphoric capacity grows steadily out of the infant's two basic modes of knowing the world, action and perception. In this light, metaphoric language is not unusual but likely. But, at the same time, metaphor, like early drawing and symbolic play, is grounded in connections that the child has never been taught to make, nor observed in the speech of others: It is genuine invention.

In our studies, we have set out in search of the roots of metaphor, posing to ourselves such questions as: What are the contexts in which metaphoric language is spontaneously produced; in particular, what is the relation of early metaphor to symbolic play? Which properties of objects serve as the grounds of early metaphor, and which are readily overridden? How might the discovery of developmental trends or individual differences provide insight into the more speculative issues of *how* and *why* metaphoric language emerges?

Before attempting to answer these questions, we must confront a possible fundamental objection: The reader may take issue with the *very notion* of early metaphor, reminding us that to make a metaphor is to deliberately violate the rules of classification, which one can only do once the rules are there to be violated. In reply, we cite the growing evidence that even infants have incipient categories (Fine, 1975; Kagan, 1970) and that children at the very early stages of language acquisition are able to respect the sort of semantic rules that are violated in metaphoric language. There is thus no justifiable *a priori* reason to exclude metaphor from the repertoire of young children. To be sure, conscious awareness of the tension involved in boundary crossing may develop more slowly in young children than the ability to effect boundary crossing connections. But the fact that first metaphors may be invented with less metalinguistic awareness than later ones and may involve boundaries somewhat fuzzier than those of adults need not disqualify them as genuine, if early, instances of metaphor. After all, if the capacity to effect novel connections is indeed a crucial part of the human repertoire, one ought to search for its most rudimentary manifestations.

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in search of first metaphors

We begin with two pieces of data: A twenty-six-month-old child, running up to one of his parents, points to a yellow plastic baseball bat, and, with a look of delight, exclaims, "Corn, corn!" And an eighteen-month-old, picking up a toy car, twists it up his mother's arm, repeating "nake" (snake). In both examples, the conventions of reference appear to have been violated: things are not called by their literal names, words are not applied according to their conventional definitions. Such utterances are not unusual in early childhood; rather, they exemplify a kind of word usage typical of the early stages of language acquisition. Yet, despite the frequency of such early uses of language, disagreement exists about just how utterances of this nature are to be understood.

In order to evaluate such unconventional word usage at the initial stages of language development, it is necessary to consider, first of all, how the child comes to make sense of the world. All developmental psychologists now make certain assumptions about the kind of mental equipment with which the child is endowed, although, to be sure, we remain uncertain about the nature of this endowment. There is disagreement about whether it consists simply of basic functional modes of interacting with the environment (as Piaget believes) or whether it encompasses domain-specific and substantive universals (as Chomsky asserts). Nonetheless, there is consensus across a wide range of researchers (Bower, 1974; Piaget, 1963) that the infant has available two fundamental ways of building knowledge of the world—perception and action. And it is upon these two modes that first sensorimotor and then symbolic realms build.

At the beginning of the first year of life, the child knows objects largely in terms of what he can do to them. Increasingly, however, objects become known as entities which have their own autonomous existence. By the middle of the second year, the child has constructed a basic understanding of space and causality and has come to the critical realization that objects exists separately from himself—that they continue to exist within a spatio-temporal framework even when he can neither act upon nor perceive them. It is this construction of sensorimotor knowledge that is the burden of the first eighteen months of life.

During the latter half of the second year, the child begins to capture knowledge through symbolic realism, most notably through language and play. Language enables the child to encode information about categories such as objects, agents, and actions; play may enable the child to elaborate his understanding of objects by assimilating novel objects into familiar action schemes (using a cup as a hat may expand the child's understanding of cups, for example). In play and language, the child is able to recreate, through symbols, those actions and objects previously known directly through sensorimotor experience.

Both play and language are, essentially, inventions. First words and initial instances of symbolic play may be imitations, but the child soon comes naturally and spontaneously to extend action and naming schemes to new objects in ways never dictated by the culture. Thus, the two-year-old does not restrict an eating scheme to food but can playfully extend it to toy food, to blocks that look like food or even to perceptually dissimilar objects that he jokingly treats as food. And in language, the child does not restrict her labels to those objects to which she has heard them applied; she also extends them to new objects which are perceived as in some way similar to their original referents. Thus, the two children mentioned above extend old words (*corn*, *snake*) to novel referents. That such extensions frequently represent a genuine leap of the imagination, rather than being simply a happy accident, is the argument that we will make here. Moreover, these novel extensions will be shown to be grounded within a delimited set of salient object properties, ones indistinguishable from the set on which adult metaphors are frequently based.

metaphor vs. overextension

Early nonliteral language lends itself, on the surface, to at least two interpretations. A child's unconventional use of a word may be an early instance of metaphor—or it may be a mistake which we, as adults, mistake, in turn, for metaphor (see Gombrich, 1961). The controversy between those who view early misnomers as metaphors and those who view them as overextensions is a difficult one to adjudicate. Both arguments appeal to the same kinds of evidence, and what counts as a convincing example of metaphor in the eyes of one observer may turn up in someone else's chart of types of overextensions. If one considers utterances such as those reported above in ignorance of the child's lexical development and of the context of the statement and the affective components involved, the conflicting interpretations fit the data equally well.

What is needed, then, are not more examples of unconventional word usage by young children (no matter how delightful), but the construction of a set of criteria by which early metaphors can be reliably distinguished from both unintentional overextensions and intentional anomalous utterances. We began with an operational definition of metaphor: *A metaphor is an utterance in which an object is deliberately given the name of something else to which it bears some resemblance.* Making judgments of similarity is, of course, a vexing philosophical problem. Therefore, rather than attempting to definitionally stipulate the degree of resemblance appropriate to metaphor, we simply required that independent judges reliably agree that a renaming was adequately grounded in resemblance. Several guidelines were used by the judges to determine whether an utterance was a deliberate renaming or a mistaken naming; the possession of the object's literal name, for instance, allowed us to infer in many cases that the child was deliberately overriding the literal name in favor of the novel one. The twenty-six-month-old who called the yellow bat corn had previously often called it a bat. This fact (as well as his evident delight at his discovery) allowed us to infer that he did not literally believe *corn* to be the object's real name. When this kind of evidence was not available, utterances were considered to be metaphoric if they were accompanied by gestures that supported the renaming and that could be shown to be in the pretend mode: The eighteen-month-old who labelled the car as a snake used symbolic gesture to make the car act like a snake rather than treating it, as he normally did, as a car. The fact that this child had demonstrated knowledge of the appropriate uses of the car allowed us to infer that treating the car as a snake was a pretend action. The same symbolic status that is granted to the pretend object substitutions of symbolic play may be granted when the substitution is a linguistic one.

Many utterances which resemble metaphors on the surface were excluded from consideration, as were utterances for which there was a lack of positive evidence indicating metaphoric status. Utterances were considered misclassifications if it was considered likely that the child had identified an object as something else (a schematic picture of a monkey eating a banana was labelled as a monkey eating a crayon, for example); utterances were considered overextensions if there was no evidence that the child possessed the literal name for the object in question and no gestural evidence that the utterance was intended in the pretend mode. If similarity between two linked elements was apparent (such as a label on a briefcase that was called spaghetti), then the utterance was considered an anomaly (see Winner, 1978).

We applied these criteria to two different bodies of linguistic data. First we examined records of the spontaneous speech of three children engaged in play with either a parent, another familiar adult, or a peer. The first of these children was one of Roger Brown's (1973) subjects (hereafter Adam), whose speech was recorded for two hours every two weeks between the ages of two and five. The other two were subjects participating in a logitudinal study of symbolic development (Wolf and Gardner, forthcoming). The speech and play of the latter two subjects, Heather and Jonathan, were recorded for approximately two hours every other week. Armed with a number of hypotheses from these analyses of spontaneous speech, we then applied our criteria to a second body of data–language elicited in an experimental situation where preschool children were engaged in a game of renaming. Child and experimenter played a game with puppets in which they took turns giving pretend names to various kinds of physical objects. (For example, the experimenter held up a pencil and renamed it a rocketship; she then offered a cylindrical flashlight battery to a three-year-old who proceeded to call it a rolled up sleeping bag [see McCarthy, Winner, and Gardner, forthcoming, for an account of the procedure used]).

From these complementary investigations, a profile of early linguistic development emerged in which metaphor played a significant role. While some unconventional word uses in children's responses did represent various types of mistakes, by far the larger portion of such word use was genuinely metaphoric. In the spontaneous speech samples, seventy two to ninety one percent (depending on the sample) of the nonliteral utterances were reliably judged to be metaphoric; in the experimentally elicited speech, sixty six percent of the renamings by preschoolers were metaphoric. Our investigations also yielded converging evidence on the nature of the origins of first metaphors and the grounds on which they are based. We will treat both of these issues below, concluding with discussions of the functions served by early metaphor and the relation between this phenomenon and the problem of novelty in general.

early metaphor: a profile

The roots of metaphor. Our studies suggest that the earliest metaphors grow from the two different roots which are the infant's two basic ways of constructing knowledge—the modes of action and perception. Moreover, the root from which a particular metaphor grows determines its nature. These twin seeds of metaphor are present in all children, but our studies suggest that children may develop a preferred mode of metaphor making.

The earliest metaphors seem to be elicited primarily in situations in which language is yoked with symbolic play. We have come to call this kind of metaphor an *enactive metaphor*; an object is transformed in symbolic play and the object is renamed accordingly. Some enactive metaphors are purely enactive, that is, grounded primarily in an enacted transformation of identity rather than static perceptual resemblance. A prototypical example of such a metaphor is that of the eighteen-month-old who slithered a toy car up his mother's arm and then renamed the car snake. Other examples abound: A two-year-old rubbed his furry teddy bear against the wooden arm of a chair. Then, holding up the bear, he said, "Zucchini"; pointing to the arm of the chair, he said, "Grater." Adam, at three and a half years, holding a yoyo to his chin, called it his beard. In these examples, the metaphors are elicited by resemblances perceived among the familiar, manipulable objects in the child's environment. Note, however, that these resemblances do not inhere solely in the objects themselves; rather, they are constructed out of the pretend gestures of symbolic play. Certainly, a stuffed animal bears little perceptual resemblance to a zucchini. However, it affords the same kind of action as a zucchini does; it can be moved up and down a flat surface as if it were being grated. The critical feature of these metaphors is that the relevant transformation appears to occur primarily on a gestural plane; the verbalization often appears tacked on to the transformation effected through symbolic play. Because such verbalizations are based on resemblances such as orientation or spatial location, they are based on qualities that could be found in virtually any object. Any object put to the chin could be a beard, any object might have functioned as the zucchini. Thus, one form of metaphor grows out of, and depends upon, an already developed symbolic mode—the actions of symbolic play.

At the other extreme, we have observed a species of metaphor that appears to emerge independently of symbolic play, arising directly out of the observance of concrete and often striking similarities between physical objects.

This kind of metaphor does not feed off of the gestural transformation of the object, but stands alone, without the support of action. A prime example of such a purely perceptual metaphor is that produced by the child who called the yellow bat corn. This child was not engaged in a symbolic play sequence in which some form of food was called for; nor did the renaming arise as he pretended to eat the bat as if it were corn on the cob. Instead, he simply looked at the bat, recognized its similarity to corn, presumably on the basis of its shape and color, and renamed it accordingly. Other examples of such metaphors can readily be found: Adam, at two and a half years, noticed a pencil and said it was a big needle; a year later, looking into his mother's black curly hair he called it dark woods; pointing to the rudder on a toy plane, he likened it to "what cows have on the bottom." A fifteen-month-old, noting how his big toe looked as it stuck out of a hole in his sock, pointed to it and said, with a laugh, "Turtle." A third kind of metaphor, situated between the two extremes, joins perceptual grounding with enactive transformation. A typical example of such a perceptual-enactive metaphor is the two and a half year old Adam calling a roll of film a busy bulldozer, a renaming accompanied by the pretend gestures of driving it across the floor.

These three kinds of metaphor appear to exist in varying proportion in the speech of individual children; we can discern both a developmental trend and individual differences from our detailed study of the spontaneous speech of three children. These findings have been further illuminated by the results of our experimental study.

Between the ages of two and two and a half, our first subject, Adam, clearly favored enactive over purely perceptual metaphors, his enactive metaphors being evenly divided between purely enactive and perceptually based enactive. Over the next two and a half years, while his production of perceptually based enactive metaphors decreased only slightly, his production of purely enactive metaphors decreased in favor of purely perceptual metaphors. This shift indicated to us a gradual disconnecting of metaphor from symbolic play, a pattern that we speculated might prove to be a general developmental trend. Although our further studies of Heather and Jonathan lent support to the notion of a gradual decline in enactive metaphors, an intriguing individual difference surfaced. Although both children (matched in age and social class) produced fewer purely enactive metaphors as they grew older, their individual profiles differed markedly: Jonathan's earliest metaphors were solely enactive; no purely perceptual metaphors were initially offered. With age he began to produce some perceptual metaphors, but perceptually based enactive metaphors remained the most frequent. Heather's earliest metaphors were distributed among the three types (as were Jonathan's later metaphors), with a slight tendency toward the perceptually based enactive variety. But with age, Heather manifested a strong proclivity toward purely perceptual metaphors; in fact, during the period from age two to three she did not offer a single purely enactive metaphor.

Although each of these two children, at some point in their development, found occasion and motivation to engage in each of the three types of metaphoric invention, their individual styles were in striking contrast overall. For Jonathan, almost any transformation was allowed. He typically paid scant attention to the properties of the object that he renamed; instead, gesture was used to transform just about any object into just about anything else. Dipping a spoon into a blanket and then lifting it to his mouth, for example, he called the blanket ice cream; using a toy ladder to pretend to cut his mother's hair, he called it a scissors; noting a paper napkin stuck to his hand, he moved his hand around and called it a puppet. This same phenomenon of indifference to the perceptual properties of the object renamed (or a powerful ability to override them) carried over into more structured task situations, where we tried to determine the limits of what each child would permit as acceptable object substitutions. When offered a spoon to use as a washcloth, Jonathan displayed no resistance but immediately treated the spoon as if it were a cloth; when offered a toy car to use as shampoo, Jonathan readily turned it upside down and pretended to shake shampoo out of it. For Jonathan, the new pretend identity was primary, while the object to be transformed was secondary. What appeared to motivate the renaming was the desire to create a pretend object; in order to do this, he chose the most available object and transformed it through symbolic gesture.

What was central for Heather, on the other hand, was the immediate object to be transformed. And what appeared to motivate the renaming was her observation of the properties of that object. In order for an object to merit a new name, it had to bear a perceptual resemblance to its new identity. Long thin blocks, for example, were called candles; a sewing maching sitting on a table, whose side view resembled the bent head and neck of a horse, was called a table-horsey; and a pillow whose corners resembled triangular ears was called a cat. Heather also continued to remain true to the perceptual properties of the object in the structured tasks. Thus, when asked to accept a clothespin under various pretend identities, she accepted it as a fish or an umbrella but not as a table or a cup. While Jonathan did not hesitate to turn a doll upside down and shake it, pretending he was sprinkling another doll with shampoo, Heather carried out a similar transformation only with a wooden cube and called it salt. The transformation of a doll into a bottle required a greater overriding of perceptual features and conventional functions than did the transformation of a cube into a saltshaker.

As both Heather and Jonathan became less enactive in their metaphor creation, the frequency with which they renamed familiar objects with conventional functions decreased. Heather's earliest metaphors were only slightly more frequently renamings of objects with strictly defined functions than of "abstract" objects such as wooden blocks, which possessed no particular function, in spite of the fact that the environment offers many more defined than abstract objects. Her later metaphors were much more commonly elicited by abstract objects than by defined objects. As Heather's employment of the three different types of metaphor evolved into a predominant use of purely perceptual metaphor, her use of defined and abstract objects correspondingly evolved into a clear preference for the abstract. With her adoption of the criterion of perceptual resemblance came an unwillingness to override the conventional functions of familiar objects.

In similar fashion, Jonathan's object-type preference developed in parallel with his metaphor preference. As his production of the three types of metaphor developed from heavily enactive to an even distribution of the three varieties, his use of familiar objects decreased. His "anything-goes" attitude was tempered; over time, perceptual grounding became more desirable, as did the avoidance of overriding conventional functions.

Our studies of Heather and Jonathon have led us to conclude that early metaphors arise both from the action of symbolic play and from the perception of resemblances. Although the metaphors of any individual child are likely to become less action oriented and more perceptually grounded with age, the dominance of one or the other of these modes—action and perception—may be appealed to in explaining the individual styles of early metaphor use. To be sure, there are many possible noncognitive reasons for these two apparently different styles; our findings could reflect a sampling gap or error, or they might reflect different kinds of renamings modelled by parents. However, in view of recent demonstrations of different styles of symbol use acquisition (see Bates, forthcoming; Nelson, 1973; Wolf and Gardner, forthcoming), it may well be that a genuine individual difference does exist among children in the kinds of first metaphors that they prefer to create. Such an individual difference need not, however, remain static over time, but in all likelihood is itself subject to developmental change.

If we have, indeed, located a genuine individual difference, we still must inquire as to the nature of this difference. First, is it a matter of preference or ability? For example, could a child with a strong preference for enactive metaphor in spontaneous play produce perceptual metaphors as easily as enactive metaphors on request? Second, if the initial difference is indeed one of ability, do children become more flexible with age? That is, whether or not the initial preference is maintained in spontaneous metaphor, do children become as able to produce in the initially more difficult mode? In order to answer these questions we consulted the results of the experimental study mentioned before, in which subjects of different ages were asked to give pretend names to a series of physical objects. All subjects participated in five conditions, two of which were designed to elicit either enactive or perceptual metaphors: In the Child Enactive Condition, children were allowed to manipulate the object, thus permitting symbolic play transformations to occur; in the Perceptual Naming Condition, children were allowed to look at, but not touch, the objects. Should an individual's preferred style prove inflexible, we would expect strong differences among children. Those with greater ability to produce enactive metaphors would perform best when allowed to manipulate the object and least well when no manipulation was permitted. For those children who prefer to produce perceptual metaphors, the pattern would either be reversed or the opportunity to manipulate the object would have no effect. If, however, children become more flexible with age in their preferred styles, differences among children would decrease with age.

Our results supported the hypothesis that styles are initially a matter of greater competence with the preferred mode and that they become flexible with age. Subjects were considered to have demonstrated an inflexible preference in style if their scores in the two conditions differed by a margin of three or more, the highest possible score being fourteen. So defined, only the youngest children revealed a pattern of individual differences. Seven (out of fifteen) three-year-olds evinced a preference: two performed better in Perceptual Naming, five performed better in the Child Enactive Condition. Among the four- and five-year-olds, except for one child at each age who performed better in Perceptual Naming than Child Enactive, no individual differences were found. Among eight- and ten-year-olds and adults, no differences were found.

To be sure, we do not know how our experimental subjects would have performed had they been seen at one or two years of age. But it is important to note that, at the youngest age at which it proved possible to carry out a metaphoric renaming task of this nature, half of the three-year-olds and all but two percent of the older subjects demonstrated the capacity to rename, whether allowed to manipulate the object or not. Thus, it appears that at least by four years of age, children have the potential to adopt either style of metaphor. What we still do now know, however, is whether the styles uncovered with Heather and Jonathan may not predetermine initial renamings and also remain as a kind of mooring underlying subsequent spontaneous metaphoric language (Shotwell, Wolf, and Gardner, forthcoming; Wolf and Gardner, forthcoming).

The shape of things. An investigation of the grounds of early metaphors—that is, the resemblances between objects motivating the renamings—reveals the bases on which novel extensions are initially made. It might be expected that early metaphors are based upon very different kinds of resemblances than are those of adults, but the findings from our studies of spontaneous speech suggest that metaphoric grounds do not change during the preschool years; the findings of our experimental study suggest that both adults and children notice the same salient object properties when engaged in the task of metaphor construction.

When metaphors are not based solely upon gestural transformation of the object, they are most frequently grounded in its overall shape. This finding was true of the spontaneous metaphors produced by our three subjects as well as the renamings produced in the experimental study. Moreover, the proclivity to ground metaphors in shape did not change significantly with age. Although there was a slight trend with age towards the use of other grounds as well, such as color or spatial configuration, and, in the experimental study, a gradual increase in the number of double- and triple-grounded metaphors, shape remained the preferred ground at all ages considered here. Only rarely was a metaphor based on a less tangible property of an object, such as its affective connotations.

Thus, the first novel perceptual links forged by the child are stimulated by the observance of resemblances in the shapes of things. The fact that the grounds of spontaneous perceptual metaphors do not change during the first five years of life casts doubt upon the view that the salience of object properties changes dramatically with age; and the additional fact that in our experimental study the grounds of both child and adult metaphors were so similar gives little comfort to those who would argue that child metaphor is necessarily produced by processes alien to those of adults. Although adults are capable of producing metaphors grounded in features besides shape and are also capable of producing multiply grounded metaphors, it is notable that in our task they did not choose to do so.

conclusion

Our two studies have yielded a plausible account of early metaphor as a phenomenon arising from the fundamental modes of action and perception. Moreover, by appealing to the predominance of one or the other of these primary sources, we have offered an explanation of the individual differences found in children's first metaphors. The kinds of empirical procedures that we have used hold promise of providing at least tentative answers to puzzles about early metaphor.

But as we turn from these issues to the question of why children produce such figures of speech and exactly how such speech casts light on the cognitive ability to create, we enter more speculative terrain. It is our view that early metaphors, whether in conversation or play, are spontaneous, untutored reflections of the child's efforts to make sense of the world. Just as the child draws initially upon her perceptual and motor capacities as a means of coming to know the physical environment, so later she begins to rely on a variety of symbol systems, and especially language, to expand that knowledge. In her effort to organize the world and to indicate perceived resemblances, she will naturally turn to figurative language to effect connections and to communicate those connections to others. To be sure, such metaphoric communication frequently brings delight; but in our opinion, initial metaphoric creations are uttered primarily in the service of knowledge and understanding rather than entertainment.

If the creation of metaphor is so natural and fundamental, perhaps the real question to be tackled is why metaphoric activity appears to cease. Recent research suggests that the spontaneous use of metaphoric language decreases markedly during the grade school years (Billow, 1977; Gardner, 1973; Gardner and others, 1975) although the reasons for such a literal stage and its significance remain controversial. Coming to understand the literal stage, in fact, appears essential to a full understanding of early metaphor. If we are to hold a defensible view of metaphoric activity as integral to learning, we must explain the concurrence of a literal stage with the intense learning period of the grade school years.

The cross-sectional study discussed above offers insight here. Although grade school children appear to produce little metaphoric language spontaneously (Billow, 1977; Pollio and Pollio, 1974), their ability to effect the kind of metaphoric connections so attractive to preschoolers remains intact. Their motivation to remark on such connections decreases, however: By the grade school years, children have acquired a sufficient vocabulary to describe most of the objects in their environment adequately in literal terms. At the same time, they become increasingly concerned about social rules and conventions which caution them against engaging in pretend play or fanciful renaming (see Rosenberg, 1977). In this period of conformism, metaphor may be viewed as a risky means of communication, especially in light of the fact that children often encounter difficulty in comprehending the more conceptual or affective metaphors produced by adults (Winner, Rosenstiel and Gardner, 1976). Thus, the rudimentary metaphors of early childhood, which capture similarities in the world of perception and action, cease to serve a central purpose. The child, no longer much concerned with sorting and labelling a world of discrete objects, now becomes increasingly involved in elaborating more abstract domains of knowledge (such as geography, biology, or the realms of human emotions) and in working out the interactions among the elements in these realms.

These abstract domains of knowledge are the phenomena out of which most adult metaphors are created. The solar system serves as a metaphor for the atom, the human body for the state, the qualities of fire or ice for moods and personalities. Individuals use metaphor to clarify for themselves and others these complex concepts; just as the emergence of early metaphors must await the incipient carving up of the world achieved through object permanence, so, too, mature metaphors awaits the development of diverse domains of knowledge, artistic as well as scientific, affective as well as conceptual. Although the kinds of phenomena metaphorically linked by children differ from those metaphorically linked by adults, both children and adults, in our view, produce metaphor to the extent that boundaries of their worlds are crossed and novel links forged. It is as delightful and insightful for the child to view the toe sticking out of the sock as a turtle as it is for the adult to imagine the conscious mind as the tip of the cerebral iceberg.

references

Bates, E., and others. *The Emergence of Symbols.* New York: Academic Press, forthcoming.

Billow, R. "Spontaneous Metaphor in Children." Unpublished paper, Adelphi University, 1977.

Bower, T. G. R. *Development in Infancy.* San Francisco: W. H. Freeman, 1974.

Brown, R. *A First Language: The Early Stages.* Cambridge, Mass.: Harvard University Press, 1972.

Fine, G. "Plato and Acquaintance." Unpublished doctoral dissertation, Harvard University, 1975.

Fodor, J. A. *The Language of Thought.* New York: Thomas Y. Crowell, 1975.

Gardner, H. *The Arts and Human Development.* New York: Wiley, 1973.

Gardner, H., and others. "Children's Metaphoric Productions and Preferences." *Journal of Child Language*, 1975, *2*, 125-141.

Gombrich, E. H. "Meditations on a Hobby Horse." In L. L. Whyte (Ed.), *Aspects of Form.* Bloomington, Ind.: Midland Books, 1961.

Kagan, J. "Attention and Psychological Change in the Young Child." *Science*, 1970, *170*, 826-832.

McCarthy, M., Winner, E., and Gardner, H. "Early Metaphors: An Experimental Investigation." Forthcoming.

Nelson, K. "Structure and Strategy in Learning to Talk." *Monographs of the Society for Research in Child Development*, 1973, *149.*

Piaget, J. *Origins of Intelligence.* New York: Norton, 1963.

Pollio, M. R., and Pollio, H. R. "The Development of Figurative Language in Children." *Journal of Psycholinguistic Research*, 1974, *3*, 185-201.

Rosenberg, L. M. "An Exploration of an Eleven Year Old's Use of Figurative Language. Unpublished honors thesis, Harvard-Radcliffe College, 1977.

Shotwell, J., Wolf, D., and Gardner, H. "Styles of Achievement in Early Symbol Use." In M. Foster and S. Brandes (Eds.), *Fundamentals of Symbolization.* Hillsdale, N.J.: Lawrence Erlbaum, forthcoming.

Winner, E., Rosenstiel, A. K., and Gardner, H. "The Development of Metaphoric Understanding." *Developmental Psychology*, 1976, *12*, 289-297.

Winner, E. "New Names for Old Things: The Emergence of Metaphoric Language." *Journal of Child Language*, forthcoming.

Wolf, D., and Gardner, H. "Style and Sequence in Symbolic Play." In N. Smith and M. Franklin (Eds.), *Symbolic Functioning in Young Children.* Hillsdale, N.J.: Lawrence Erlbaum, forthcoming.

Ellen Winner, Margaret McCarthy, and Howard Gardner form part of the early metaphor research team at Harvard Project Zero. In addition, Ellen Winner teaches psychology at Boston College. Margaret McCarthy brings to her work on the Project a background in philosophy and linguistics. Howard Gardner, co-director of Project Zero, combines his work on the development of symbolic capacities with research on the breakdown of these capacities in brain damaged patients. Sandra Kleinman, formerly a research assistant at Project Zero, is currently a reading and learning disabilities specialist at Boston Children's Hospital.